

**IN THE CLAIMS**

- 1 1. (currently amended) A method for estimating a parameter of interest of an earth  
2 formation with a tool having a nuclear radiation source and a nuclear radiation  
3 detector spaced apart from the nuclear radiation source, the method comprising:  
4 (a) activating the nuclear radiation source;  
5 (b) defining a starting time for a processing time window at which  
6 measurements made by the nuclear radiation detector are responsive  
7 primarily to the parameter of interest;  
8 (c) ~~defining~~ processing the measurements for determining an ending time for  
9 the processing time window at which the measurements are substantially  
10 uncontaminated by noise; and  
11 (d) analyzing the measurements within the processing time window for  
12 estimating the parameter of interest.

- 13  
1 2. (previously presented) The method of claim 1 wherein defining the starting time  
2 further comprises determining a time at which a value of the measurements has a  
3 predetermined relationship to an estimated value of a parameter of interest at an  
4 ending time of a processing time window for an earlier operation of said source.

- 5  
1 3. (previously presented) The method of claim 1 wherein the nuclear radiation  
2 source comprises a pulsed neutron source.

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1 4. (previously presented) The method of claim 1 wherein the measurements made by  
2 the nuclear radiation detector comprise gamma ray measurements.

3  
1 5. (previously presented) The method of claim 3 wherein the parameter of interest  
2 comprises at least one of (i) a thermal neutron capture cross section of the earth  
3 formation, (ii) porosity, (iii) formation water salinity, and, (iv) the quantity and  
4 type of hydrocarbons contained in pore spaces.

5  
1 6. canceled

2  
1 7. (previously presented) The method of claim 2 wherein said relationship is of the  
2 form

3 
$$istr = K / \Sigma$$

5 where *istr* is the start time of a window, *K* is a constant, and  $\Sigma$  is a capture cross  
6 section at the ending time of the processing time window for the earlier operation  
7 of the source.

8  
1 8. (currently amended) The method of claim 1 wherein ~~defining~~ determining the  
2 ending time of the processing window further comprises forming a running sum  
3 of count rates starting at the starting time.

4

1 9. (currently amended) The method of claim 8 wherein ~~defining~~ determining the  
2 ending time of the processing window further comprises determining a time at  
3 which a count rate has a predetermined relation to said running sum.

4

1 10. (previously presented) The method of claim 1 further comprising partitioning  
2 the processing time window into a plurality of channels (time intervals) having  
3 a length depending upon the starting time.

4

1 11. (currently amended) An apparatus for use within a borehole penetrating an earth  
2 formation for estimating a parameter of interest of said earth formation,  
3 comprising:

4 (a) a nuclear radiation source irradiating the earth formation;

5 (b) a nuclear radiation detector spaced apart from said nuclear radiation  
6 source;

7 (c) a processor which

8 (i) defines a starting time for a processing time window at which  
9 measurements made by the nuclear radiation detector are  
10 responsive primarily to the parameter of interest; and

11 (ii) ~~defines~~ processes the measurements to determine an ending time  
12 for the processing time window at which the measurements made  
13 by the nuclear radiation detector are substantially uncontaminated

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14 by noise.

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1 12. (previously presented) The apparatus of claim 11, wherein the processor defines  
2 the starting time by determining a time at which a value of the measurements has  
3 a predetermined relation to a determined value of a parameter of interest at an  
4 ending time of a processing time window for an earlier operation of the nuclear  
5 radiation source.

6

1 13. (previously presented) The apparatus of claim 12 wherein the processor  
2 further analyzes the measurements within said processing time window  
3 and determines the parameter of interest.

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1 14. (previously presented) The apparatus of claim 12, wherein the nuclear radiation  
2 source further comprises a pulsed neutron source.

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1 15. (previously presented) The apparatus of claim 14, wherein the measurements  
2 made by the nuclear radiation detector comprise gamma ray measurements.

3

1 16. (previously presented) The apparatus of claim 14, wherein the parameter of  
2 interest comprises at least one of (i) a thermal neutron capture cross section of the  
3 earth formation, (ii) porosity, (iii) formation water salinity, and, (iv) the quantity  
4 and type of hydrocarbons contained in pore spaces.

5

1 17. (previously presented) The method of claim 12 wherein said relationship is of the  
2 form

3 
$$istr = K / \Sigma$$

5 where *istr* is the start time of a window, *K* is a constant, and  $\Sigma$  is a capture cross  
6 section at the ending time of the processing time window for the earlier operation  
7 of the source.

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9

1 18. (currently amended) The apparatus of claim 11 wherein the processor ~~defines~~  
2 determines the ending time based on forming a running sum of count rates  
3 starting at the starting time.

4

1 19. (currently amended) The apparatus of claim 18, wherein processor ~~defines~~  
2 determines said ending based on forming a running sum of count rates starting at  
3 said starting time.

4

1 20. (currently amended) The method of claim 19, wherein said processor ~~defines~~  
2 determines said ending time based on determining a time at which a count rate has  
3 a predetermined relation to said running sum.

1 21- 28. Canceled

2

1 29. (currently amended) The ~~system apparatus~~ of ~~claim 21~~ claim 11 further  
2 comprising a conveyance device which conveys the tool into a borehole in the  
3 earth formation.

4

1 30. (currently amended) The ~~system apparatus~~ of ~~claim 21~~ claim 29 wherein the  
2 conveyance device is one of (i) a wireline, (ii) coiled tubing.

3

1 31. (currently amended) The ~~system apparatus~~ of ~~claim 21~~ claim 11 further  
2 comprising a channel number generator which produces a numerical sequence of  
3 memory address codes corresponding to a sequence of adjacent time windows.

4

1 32. (currently amended) The ~~system apparatus~~ of ~~claim 21~~ claim 11 further  
2 comprising a mass storage unit associated with the processor.

3

1 33. (currently amended) The ~~system apparatus~~ of claim 31 further comprising a  
2 spectrum accumulator.

3

1 34. (currently amended) The ~~system apparatus~~ of claim 30 wherein the conveyance  
2 device comprises a wireline, the system further comprising a depth controller  
3 which provides signals indicative of a depth of said tool.